

APPLICANT(S): RODYUSHKIN, Konstantin et al.
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AMENDMENTS TO THE CLAIMS

Please amend the claims to read as follows, and cancel without prejudice or disclaimer to resubmission in a divisional or continuation application claims indicated as cancelled:

1. (cancelled)
2. (currently amended) The method of claim 1 6, wherein said process further includes:
initializing said deformable mouth model template according to a base image of said sequence.
3. (currently amended) The method of claim 1 6, wherein estimating said features includes estimating positions of lips of said mouth.
4. (currently amended) The method of claim 1 6, wherein estimating said features includes estimating shapes of lips of said mouth.
5. (currently amended) The method of claim 1 6, wherein estimating said features includes estimating positions of teeth in said mouth.
6. (currently amended) ~~The method of claim 1,~~ further A method comprising:
estimating features of a mouth in a current image of a sequence of digital images of a human face by deriving a deformable mouth model template in an iterative process, said process including:
minimizing an energy function receiving iteration-dependent arguments to determine optimal transformation parameters of an iteration-dependent transformation;
transforming components of said deformable mouth model template by said iteration-dependent transformation having said optimal transformation parameters;
double-blurring particular digital images of said sequence to produce double-blurred images; and
double-filtering maps derived from said current image to produce double-filtered maps,
wherein for a particular iteration, minimizing said energy function includes minimizing said energy function receiving said double-blurred images and said double-filtered maps, and said iteration-dependent transformation is a coarse transformation.

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7. (original) The method of claim 6, wherein double-blurring said particular digital images includes double-blurring said current image, double-blurring a previously processed image of said sequence and double-blurring a base image of said sequence.

8. (original) The method of claim 6, wherein double-filtering said maps includes double-filtering a spatial luminance peaks and valleys map derived from said current image and double-filtering a vertical intensity gradient map derived from said current image.

9. (original) The method of claim 6, wherein double-filtering said maps includes applying a dilate morphological operator recursively to said maps.

10. (original) The method of claim 6, wherein said coarse transformation represents a relative displacement of a center of said mouth.

11. (currently amended) ~~The method of claim 1, further~~ A method comprising:

estimating features of a mouth in a current image of a sequence of digital images of a human face by deriving a deformable mouth model template in an iterative process, said process including:

minimizing an energy function receiving iteration-dependent arguments to determine optimal transformation parameters of an iteration-dependent transformation;

transforming components of said deformable mouth model template by said iteration-dependent transformation having said optimal transformation parameters;

blurring particular digital images of said sequence to produce blurred images; and

filtering maps derived from said current image to produce filtered maps,

wherein for a particular iteration, minimizing said energy function includes minimizing said energy function receiving said blurred images and said filtered maps, and said iteration-dependent transformation is a fine transformation.

12. (original) The method of claim 11, wherein blurring said particular digital images includes blurring said current image, blurring a previously processed image of said sequence and blurring a base image of said sequence.

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13. (original) The method of claim 11, wherein filtering said maps includes filtering a spatial luminance peaks and valleys map derived from said current image and filtering a vertical intensity gradient map derived from said current image.

14. (original) The method of claim 11, wherein filtering said maps includes applying a dilate morphological operator to said maps.

15. (original) The method of claim 11, wherein said fine transformation is a lip transformation that represents a relative displacement of a center of said mouth, a relative stretching of said mouth and a relative opening of the jaw of said mouth.

16. (original) The method of claim 11, wherein said fine transformation is a teeth transformation that represents a relative opening of the jaw of said mouth.

17. (currently amended) ~~The method of claim 1,~~ A method comprising:

estimating features of a mouth in a current image of a sequence of digital images of a human face by deriving a deformable mouth model template in an iterative process, said process including:

minimizing an energy function receiving iteration-dependent arguments to determine optimal transformation parameters of an iteration-dependent transformation; and

transforming components of said deformable mouth model template by said iteration-dependent transformation having said optimal transformation parameters,

wherein for a particular iteration, said iteration-dependent transformation is a superfine transformation and minimizing said energy function includes minimizing said energy function receiving said current image, a previously processed image of said sequence, a base image of said sequence, a spatial luminance peaks and valleys map derived from said current image, and a vertical intensity gradient map derived from said current image.

18 – 22 (cancelled)

23. (currently amended) ~~The method of claim 21,~~ A method comprising:

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estimating features of a mouth in a current image of a sequence of digital images of a human face by deriving a deformable mouth model template, wherein deriving said deformable mouth model template includes:

minimizing an energy function to determine optimal transformation parameters of a transformation; and

transforming components of said deformable mouth model template by said transformation having said optimal transformation parameters,

wherein said energy function includes an elastic spline energy term to attract contours of said deformable mouth model template to respective parabolas,

wherein said energy function is a lips energy objective function and said elastic spline energy term is related to a square of a width of said mouth in a base image of said sequence.

24 – 25 (cancelled)

26. (currently amended) ~~The method of claim 24,~~ A method comprising:

estimating features of a mouth in a current image of a sequence of digital images of a human face by deriving a deformable mouth model template, wherein deriving said deformable mouth model template includes:

minimizing an energy function to determine optimal transformation parameters of a transformation; and

transforming components of said deformable mouth model template by said transformation having said optimal transformation parameters,

wherein said energy function includes a teeth gap energy term to describe vertical gaps between the upper teeth and lower teeth,

wherein said energy function is a teeth energy objective function and said teeth gap energy term also describes vertical edges of teeth and an absence of teeth in a cavity of said mouth.

27. (original) A method comprising:

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estimating features of a mouth in a current image of a sequence of digital images of a human face by deriving a deformable mouth model template, wherein deriving said deformable mouth model template includes:

minimizing an energy function to determine optimal transformation parameters of a transformation; and

transforming components of said deformable mouth model template by said transformation having said optimal transformation parameters,

wherein said energy function includes a texture energy term to describe texture differences in lips and corners of said mouth compared to a different image of said sequence.

28. (original) The method of claim 27, wherein said different image is a base image of said sequence.

29. (original) The method of claim 27, wherein said different image is a previously processed image of said sequence.

30. (original) A method comprising:

estimating features of a mouth in a current image of a sequence of digital images of a human face by deriving a deformable mouth model template, wherein deriving said deformable mouth model template includes:

minimizing an energy function to determine optimal transformation parameters of a transformation; and

transforming components of said deformable mouth model template by said transformation having said optimal transformation parameters,

wherein said energy function includes a corner energy term that attracts lip corners to an area having a particular vertical intensity gradient structure.

31. (original) The method of claim 30, wherein said corner energy term includes a sum of products of a vertical intensity gradient and a kernel in a left corner of said mouth and in a right corner of said mouth.

32. (original) The method of claim 30, wherein said corner energy term is zero for coarse transformations.

33 - 41 (cancelled)